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(54) Title: METHOD AND DEVICE FOR VIEWING A BURNER FLAME

(57) Abstract: A method of viewing the flame produced by a burner in a furnace is provided, comprising viewing the flame through an interference filter adapted to pass light of only a narrow wavelength range, in which the wavelength range corresponds to a wavelength which is stronger in the light emitted by the burner than in the ambient light of the furnace. The method is particularly applicable to viewing the flames produced by natural gas burners in petroleum crackers and the preferred wavelength range is that of sodium.

Claims

1. A method of viewing the flame produced by a burner in a furnace, comprising viewing the flame through an interference filter adapted to pass light of only a narrow wavelength range, wherein the wavelength range corresponds to a wavelength which is stronger in the light emitted by the burner than in the ambient light of the furnace.

2. A method as claimed in claim 1, wherein the filter is a sodium interference filter.

3. A method of viewing the flame produced by a burner in a furnace, comprising viewing the flame through an interference filter adapted to pass light of the wavelength of sodium only.

4. A method as claimed in claim 1, 2 or 3, wherein the furnace is the pyrolysis section of a petroleum cracker.

5. A method as claimed in any preceding claim, wherein the fuel burnt by the burner is natural gas.

6. A method as claimed in any preceding claim, wherein the fuel burnt by the burner is a mixture of hydrogen, methane and air.

7. A method as claimed in any preceding claim, wherein a window is provided in the wall of the furnace through which the burner can be viewed.

8. A method as claimed in claim 6, wherein the window is made of quartz.

9. A method as claimed in claim 7 or 8, wherein the interference filter is provided as a panel attached to

the window of the furnace.

10. A method as claimed in claim 9, wherein the panel is hinged to the furnace so it can be placed over the window or removed by a user as required.

11. A method as claimed in any preceding claim, wherein a pair of glasses or goggles having an interference filter in each lens thereof is provided.

12. A method as claimed in any preceding claim, wherein the interference filter is provided in a camera arranged inside the furnace and adapted to photograph the burner at regular intervals.

13. A method as claimed in claim 12, wherein the information from the camera is relayed to an operator who makes any necessary adjustments to the burner from a remote location.

14. A method as claimed in claim 12 or 13, wherein the camera is programmed to photograph the burner about once every 10 minutes.

15. A method as claimed in any of claims 12 to 14, wherein the camera is programmed to move along a row of burners and to photograph groups of one or more burners in turn.

16. An apparatus for viewing the flame produced by a burner in a furnace, comprising an interference filter adapted to pass light of only a narrow wavelength range, wherein the wavelength range corresponds to a wavelength which is stronger in the light emitted by the burner flame than in the ambient light of the furnace.

17. An apparatus as claimed in claim 16, wherein the

interference filter is a sodium interference filter.

18. An apparatus for viewing the flame produced by a burner in a furnace, comprising an interference filter adapted to pass light of the wavelength of sodium only.

19. An apparatus as claimed in claim 16, 17 or 18, wherein a window is provided in the wall of the furnace through which the burner can be viewed.

20. An apparatus as claimed in claim 19, wherein the window is made of quartz.

21. An apparatus as claimed in claim 19 or 20, wherein the interference filter is provided as a panel attached to the window of the furnace.

22. An apparatus as claimed in claim 20 or 21, wherein the filter is a panel which can be placed over the window or removed by a user as required.

23. An apparatus as claimed in any of claims 16 to 22, wherein the apparatus comprises a pair of glasses or goggles comprising an interference filter in each lens thereof.

24. An apparatus as claimed in any of claims 16 to 23, wherein the apparatus comprises a camera in which an interference filter is provided, wherein the camera is arranged inside the furnace and adapted to photograph the burner at regular intervals.

25. An apparatus as claimed in claim 24, comprising means for relaying the information from the camera to an operator and means for making any necessary adjustments to the burner from a remote location.

26. An apparatus as claimed in claim 24 or 25, wherein the camera is programmed to photograph the burner about once every 10 minutes.

27. An apparatus as claimed in any of claims 24 to 26, wherein the camera is programmed to move along a row of burners and to photograph groups of one or more burners in turn.

28. A furnace comprising a burner housed within the walls thereof and a window provided in a wall of the furnace, wherein am interference filter adapted to pass light of only a narrow wavelength range is provided in or on the window.

29. Glasses comprising an interference filter provided in each lens thereof, wherein the interference filter is adapted to pass light of only a narrow wavelength range.

can be done by adjusting the quantity of fuel supplied to the burner and/or by adjusting the ratio of fuel supplied to air and/or by adjusting the direction of the jets of fuel.

In order to monitor the size and orientation of the burner flames, an operator views the flames at regular intervals and then makes any adjustments which may be required. However, the heat in the pyrolysis section is such that the walls of the cracker are heated to a temperature of about 1100°C. Consequently, radiant heat is given off from the walls to create a bright background against which it is very difficult to see the burner flames.

In the past, this problem has been overcome by adding either copper or sodium bicarbonate to the flames to provide a colour which is visible against the bright background of the walls of the cracker. To do this however, the pyrolysis chamber must be opened up and the copper or sodium bicarbonate thrown into the flames. It will be appreciated that at the operating temperatures in question this is a complex procedure which results in significant inconvenience and energy losses.

The present invention seeks to provide a method of viewing the flames of the burners in a furnace such as the pyrolysis chamber of a cracker which can be carried out quickly and easily and without the need to lose heat from the furnace.

The applicants have realised that if the light emitted by the burner flames or a part of that light could be separated from the background radiant light in the furnace, the burner flames could then be viewed without the need for complex solutions such as throwing additives into the flames.

From a first aspect, the present invention provides a method of viewing the flame produced by a burner in a furnace, comprising viewing the flame through an interference filter adapted to pass light of only a

narrow wavelength range, wherein the wavelength range corresponds to a wavelength which is stronger in the light emitted by the burner flame than in the ambient light of the furnace.

Thus, the interference filter acts to block out the bulk of the abient light of the furnace such that the burner flame is clearly visible.

It will be appreciated that the wavelength range of the interference filter could be determined by carrying out a spectroscopic analysis of the burner flame to find the wavelength of a peak in the spectrum thereof.

In one preferred embodiment of the invention, the furnace is the pyrolysis section of a petroleum cracker. The method is particularly advantageous in such an environment as the walls of the cracker are heated to a very high temperature such that they emit significant levels of white light which makes it difficult or even impossible to see the flame of a burner in the cracker under normal circumstances.

Typically, the fuel which is burnt in the petroleum cracker is natural gas and most typically, a mixture of hydrogen, methane and air. Tests have shown that this fuel can contain traces of sodium. The reason for this is not known but it is thought to be because methane and natural gas often come from environments in which salt is present. In a preferred embodiment of the method of the invention therefore, the filter used is a sodium interference filter which filters out substantially all the light other than the sodium light emitted by the sodium trace elements in the fuel.

Preferably the sodium interference filter has a pass bandwidth of approximately 10nm so that light of wavelength 0.584 to 0.594μm may pass through the filter. More preferably the pass bandwidth is 2 to 5nm and, still more preferably, the pass bandwidth is 1nm so that only light of wavelength 0.589μm passes through the filter.

The use of a sodium interference filter is particularly advantageous as there is effectively no light of the wavelength of sodium present as ambient light in the furnace such that the burner flame is very clearly visible using this method.

The use of a sodium interference filter to view a burner flame in a furnace is considered to be novel and inventive in its own right and so, from a further aspect, the present invention provides a method of viewing the flame produced by a burner in a furnace, comprising viewing the flame through an interference filter adapted to pass light of the wavelength of sodium only.

The sodium interference filter could take any form and the burner in the furnace could be viewed through a door which is opened in use as in known systems. Preferably however, a window is provided in the wall of the furnace through which the burner can be viewed. This has the advantage that the furnace does not need to be opened each time that the burners are viewed. Thus the temperature inside the furnace is not disturbed and thermal currents which can distort the action of the burner flame are not created by opening and closing the furnace at regular intervals.

Preferably, the window is made of quartz which is a material capable of withstanding the temperature gradient across the wall of the furnace while also providing the necessary transparency.

In one preferred embodiment, the interference filter could be provided as a panel attached to the window of the furnace.

Still more preferably, the filter is a panel which can be placed over the window or removed by a user as required. Thus for example, the filter could be hinged to the wall of the furnace to allow quick and easy adjustment thereof.

In an alternative embodiment, a pair of glasses or

goggles comprising an interference filter in each lens thereof is provided. This has the advantage of allowing a user to carry the glasses with him for example from one furnace to the next. The goggles have the additional advantage that they could also be used with a traditional furnace in which no sealed window is provided but a door is merely opened when a user wishes to look inside the furnace.

In a still further preferred embodiment of the invention, the interference filter could be provided in a camera arranged inside the furnace and adapted to photograph the burner at regular intervals. The information from the camera could then be relayed to an operator who could make any necessary adjustments to the burner from a remote location. This would clearly be advantageous in a large scale refinery or similar scale production plant where considerable numbers of personnel would be required to monitor the operation of each furnace in situ.

Ideally the camera could be programmed to photograph the burner about once every 10 minutes.

It will be appreciated that the furnace would normally include a plurality of burners and, in the case of a petroleum cracker, ten or more burners could be provided. Thus if necessary, the camera could be programmed to move along a row of burners and to take several pictures of respective burners or groups thereof.

From a further aspect, the present invention provides an apparatus for viewing the flame produced by a burner in a furnace, comprising an interference filter adapted to pass light of only a narrow wavelength range, wherein the wavelength range corresponds to a wavelength which is stronger in the light emitted by the burner than in the ambient light of the furnace.

Preferably, the interference filter is a sodium interference filter.

The provision of a sodium interference filter is considered to be novel and inventive in its own right and so from a further aspect, the present invention provides an apparatus for viewing the flame produced by a burner in a furnace, comprising an interference filter adapted to pass light of the wavelength of sodium only.

In one preferred embodiment, the apparatus further comprises a window provided in the wall of the furnace through which the burner can be viewed.

Preferably, the window is made of quartz.

In one preferred embodiment, the interference filter could be provided as a panel attached to the sealed window of the furnace.

Still more preferably, the filter is a panel which can be placed over the window or removed by a user as required. Thus for example, the filter could be hinged to the wall of the furnace to allow quick and easy adjustment thereof.

The provision of a panel over the window is considered to be novel and inventive in its own right and so, from a further aspect, the present invention provides a furnace comprising a burner housed within the walls thereof and a window provided in a wall of the furnace, wherein am interference filter adapted to pass light of only a narrow wavelength range is provided in or on the window.

In an alternative embodiment, the apparatus comprises a pair of glasses or goggles comprising an interference filter in each lens thereof.

The provision of such goggles is also considered to be novel and inventive in its own right and so, from a further aspect, the present invention provides glasses comprising an interference filter provided in each lens thereof, wherein the interference filter is adapted to pass light of only a narrow wavelength range.

In another alternative embodiment of the invention, the apparatus comprises a camera in which the